

Arctic Sciences GPRA Highlights, FY 2006

Cultural Bio-Geography of King Island, Alaska

Nugget ID: 11565

The Cultural Bio-Geography of King Island, Alaska is a project conceived in a collaboration between the Native community of King Island Alaska and the PI, Deanna Kingston of Oregon State University. King Island is located approximately 40 miles from the mainland and was occupied into the mid 1900's by approximately 200 Inupiat (Eskimo) who lived a subsistence life way hunting walrus, seal, birds, and gathering berries and greens on the island. In 1959 the Bureau of Indian Affairs closed the school on King Island forcing the King Island residents to choose between moving to Nome so that their children could attend school, as mandated by Alaska State law, or sending their children to boarding school. All but some of the oldest community members chose to move with their children forcing them to live in diaspora for almost half a century. In the summer of 2005, 30 community members, ranging from the ages of 80 to 15, returned to their home community on King Island accompanied by a team of scientists, including anthropologists, biologists, archaeologists, geographers, and linguists. Based on theoretical suppositions that memory can be enhanced by place, the community's interest in the project was to gather as much information, biological, linguistic, geographical, historical, cultural, social, etc. before the information was lost with the passing of the oldest generation. The researchers' interests were not only in the data made possible through recovered memory, but in gaining a holistic picture of an entire social-cultural and knowledge system that existed on King Island prior to its abandonment. To immerse the younger generation in the knowledge of their elders and in the science surrounding the return to King Island and the researchers hoped to gain a deeper understanding of the lived experience of communities in diaspora. This last goal is particularly relevant today as many Arctic communities are having to make decisions about relocating due to the destruction of their homes from coastal and riverine erosion as a result of the changing climate in the Arctic; most notably Shishmaref, Alaska. This research will potentially inform the process by enlightening a community of the way in which this decision was made by other communities historically and the results of their choices. This is a very scientifically innovative project. It was formulated through the combined vision of both an indigenous community and scientists. Throughout the project the two groups have collaborated fully in the decisions made about the project. In addition, it will provide a holistic view of an entire community's evolution in diaspora, something not possible among most communities living in diaspora.

This work is notable because:

The King Island Cultural Bio-geography project was a collaboration between the PI, OSU researcher Deanna Kingston and the Alaska Native community of King Island Inupiat (Eskimos). Over 30 community members, age range from 80 to 15, participated in the project of returning to their natal village for the first time since its abandonment in the 1960s under governmental pressure. The community returned to King Island accompanied by anthropologists, oral historians, geographers, linguists and archaeologists to collect traditional knowledge, map the archeological and historic sites, record place names, and linguistic information. This project is an unprecedented collaboration between an indigenous community and an NSF researcher, herself Inupiat, to gain a deeper understanding of the lived experience of communities in diaspora, as well as a full record of the abandoned community and the cultural context within which the last 40 years have unfolded.

Primary Goal Indicator: Greater diversity (AC/GPA selected)

Secondary Goal Indicators: Continuous learning, Public understanding of science, Contributions, Collaborations, Connections, Underrepresented individuals and institutions (AC/GPA selected), Research on learning and teaching

Other Indicators:

OI-3: This work involves multidisciplinary research.

The research was a collaboration not only with the Inupiaq community of King Island but included a collaboration between anthropologists, geographers, biologists, linguists and archaeologists. The disciplines worked together with the community to define the research topics and to do the data collection. In order to fully understand the cultural bio-geographical context in which King Island people lived prior to emigration and how their culture and society changed post emigration, these disciplines had to work together to complete a holistic picture of life on the Island and off.

OPP/ARC 2006

Program Officer: Anna Kerttula de Echave

NSF Award Numbers:

0328234

Award Title: Documenting the Cultural Geography, Biogeography, and Traditional Ecological Knowledge (TEK) of King Island, Alaska

PI Name: Deanna Kingston

Institution Name: Oregon State University

PE Code: 5221

Submitted on 01/10/2006 by Anna Kerttula

ARC: Approved 02/17/2006 by Kimiko S. Bowens-Knox

OPP: Approved for OPP on 02/17/2006 by Kimiko S. Bowens-Knox

Mercury deposition in northern Alaska

Nugget ID: 12136

The atmospheric loading of mercury is relatively uniform around the globe, and derives in large measure from anthropogenic sources. In the Arctic the processes that would normally cleanse the air of this mercury load are very slow in mid-winter. Once the sun rises and temperatures moderate, however, the mercury is deposited through a complex series of chemical reactions. Scientists have found that water vapor deposition, in the form of diamond dust, frost flowers, rime, surface hoar, and snowfall, are far more critical in the deposition process than previously thought. Surprisingly high concentrations of mercury have been found on the sea ice and in coastal terrestrial environments. Virtually all of the mercury entering the coastal arctic ecosystem enters via the snowpack through these deposition processes. They are now working on understanding the fate of the deposited material.

Some of the mercury is quickly re-emitted from the snow back to the air, but some also works its way into the organic sediment of the terrestrial environment. Stories about mercury always seem to end up as scare stories, but there is no reason based on these data to think the concentrations are increasing. Mainly, the initial values are higher in some places than anybody thought.

This work is notable because:

This is an interdisciplinary project using Mercury to tie together systems environmental knowledge

Primary Goal Indicator: Collaborations

Secondary Goal Indicators: Contributions

Other Indicators:

OI-3: This work involves multidisciplinary research.

This work is inherently interdisciplinary, employing physics, chemistry, ecosystems studies.

OPP/ARC 2006

Program Officer: Neil Swanberg

NSF Award Numbers:

0435989

Award Title: Collaborative Research on Snow and Ice Processes in the Deposition and Fate of Mercury in the Arctic

PI Name: Matthew Sturm

Institution Name: Department of Army Cold Regions Research & Engineering Lab

PE Code: 5219

0435922

Award Title: Collaborative Research on Snow and Ice Processes in the Deposition and Fate of Mercury in the Arctic

PI Name: William Simpson

Institution Name: University of Alaska Fairbanks Campus

PE Code: 5219

0435893

Award Title: Collaborative Research on Snow and Ice Processes in the Deposition and Fate of Mercury in the Arctic

PI Name: Joel Blum

Institution Name: University of Michigan Ann Arbor

PE Code: 5219

Submitted on 02/23/2006 by Neil R. Swanberg

ARC: Approved 03/03/2006 by Kimiko S. Bowens-Knox

OPP: Approved for OPP on 03/03/2006 by Kimiko S. Bowens-Knox

Mosquitoes as Monitors of Mercury in the Environment

Nugget ID: 12615

Inorganic mercury is deposited from the atmosphere to the earth's surface, including aquatic deposition. Inorganic mercury is converted to methylmercury by bacteria and accumulates in the aquatic food web. Consumption of mercury-contaminated fish is a health concern, particularly for subsistence fishers. Until recently, though, a direct connection between inputs of inorganic mercury and accumulation of methylmercury in aquatic organisms had not been established firmly. Chad Hammerschmidt and William F. Fitzgerald have monitored atmospheric mercury deposition and mercury accumulation in mosquitoes, an organism with an aquatic life stage, from Florida to the Arctic. They found a strong correlation between atmospheric deposition of mercury and the amount of methylmercury in the adult mosquitoes sampled. This suggests that mosquitoes, a ubiquitous and readily sampled organism, may serve as a useful and sensitive indicator of mercury loading, including atmospheric loading, to aquatic system.

This work is notable because:

This result indicates that entomological analyses may be important indicators of the state of the aquatic environment.

Primary Goal Indicator: Cross-disciplinary

Secondary Goal Indicators:
Other Indicators:

OI-3: This work involves multidisciplinary research.

This research involved atmospheric chemistry and aquatic ecology, as well as chemical analyses of entomological samples

OPP/ARC 2006

Program Officer: William Wiseman

NSF Award Numbers:
0425562

Award Title: Biogeochemical Cycling and Fate of Mercury and Methylmercury in the Arctic Alaskan Lakes

PI Name: William Fitzgerald

Institution Name: University of Connecticut

PE Code: 5280

Submitted on 03/09/2006 by William J. Wiseman

ARC: Approved 03/10/2006 by Kimiko S. Bowens-Knox

OPP: Approved for OPP on 03/10/2006 by Kimiko S. Bowens-Knox

Snow Sublimation

Nugget ID: 12139

Winter lasts 8 to 10 months of the year in the Arctic. During that time water is stockpiled in the form of snow. In some places 80% of the annual run-off comes from the snow. Past estimates of winter water losses due to sublimation range as high as 40% of the total winter accumulation, but recent measurements in the coastal zone of the Arctic suggest that this value is far too high. In fact, through much of the winter scientists have measured a net accumulation of water mass through condensation in the form of rime and frost. Not until late spring and the arrival of near-freezing temperatures and long periods of sunlight does the sublimation in this coastal zone become important. The source of the moisture is leads and openings in the sea ice. High speed wind events enhance the sublimation but are too infrequent to affect the winter balance. The climate-induced reduction in the sea ice cover could actually increase the winter water balance by further increasing winter condensation.

This work is notable because:

This research is developing new knowledge that is of significance to climate change issues.

Primary Goal Indicator: Contributions

Secondary Goal Indicators: Collaborations

Other Indicators:

OI-3: This work involves multidisciplinary research.

This work is a combination of detailed snow physics, hydrology, meteorology and climate change science

OPP/ARC 2006

Program Officer: Neil Swanberg

NSF Award Numbers:

0229973

Award Title: Winter Precipitation, Sublimation, and Snow-Depth in the Pan-Arctic: Critical Processes and a Half Century of Change

PI Name: Glen Liston

Institution Name: Colorado State University

PE Code: 5219

Submitted on 02/23/2006 by Neil R. Swanberg

ARC: Approved 02/23/2006 by Kimiko S. Bowens-Knox

OPP: Approved for OPP on 02/23/2006 by Kimiko S. Bowens-Knox

Thawing Permafrost and Vanishing Lakes

Nugget ID: 12172

Rising Arctic temperatures over the past two decades appear to have thawed the ground enough to allow more than 125 lakes to drain into the soil and vanish. This provides additional evidence that the 20-year-old warming trend documented in the Arctic is physically affecting the landscape. The abrupt draining has the potential to alter entire continental ecosystems as migratory birds and other wildlife depend on the waterways.

Most of the affected lakes form atop a solid layer of permafrost, or permanently frozen ground that prevents the lakes from draining, allowing hundreds of thousands of ponds, lakes and wetlands to dot the Arctic landscape.

These findings indicate the current warming may be thawing the permafrost layer and causing lakes initially to grow and expand then seep into the ground. As temperatures in the region continue to rise, this trend is expected to persist and spread northward, resulting in the disappearance of more lakes.

The lakes are a dominant feature of the Arctic landscape and their disappearance could have a devastating effect on the living conditions of native people and Arctic wildlife.

This work is notable because:

This work provided new understanding of fundamental processes in the Arctic.

Primary Goal Indicator: Contributions

Secondary Goal Indicators: Connections

Other Indicators:

OI-3: This work involves multidisciplinary research.

Scientists from several disciplines were involved in this work.

OPP/ARC 2006

Program Officer: Neil Swanberg

NSF Award Numbers:

0230391

Award Title: River discharge from the Russian Federation: An understanding of contemporary trends and their placement in a Holocene context

PI Name: Laurence Smith

Institution Name: University of California-Los Angeles

PE Code: 5219

Submitted on 02/23/2006 by Neil R. Swanberg

ARC: Approved 02/23/2006 by Kimiko S. Bowens-Knox

OPP: Approved for OPP on 02/23/2006 by Kimiko S. Bowens-Knox

The Importance of Fungi-Plant Symbiosis

Nugget ID: 12616

It has been known for many years that an important symbiosis exists between the soil fungi and certain plants. When nitrogen is limiting, the fungi transport soil nitrogen to plant roots and receive plant sugars in return. Efforts to measure the importance of this process have been questioned, since the techniques involved were either disruptive or manipulative and, thus, can be argued not to be representative of the natural environment. John E. Hobbie and Erik A Hobbie have used data collected from the Arctic Long Term Ecosystem Research site at Toolik Lake, AK to place numbers on the importance of this process. They rely on the fractionation of nitrogen isotopes by fungi. They find that between 61 and 86% of the nitrogen in the plants is provided by the fungi and between 8 and 17% of the plants' photosynthetic carbon is provided to the fungi for growth and respiration. Because of the relative ubiquity of the fungi-plant relationship, this approach should help interpret ecological observations at many other research sites and have applications to improved farming practices.

This work is notable because:

This work recognizes the possibility of using products of natural processes to obtain measures of important ecological rates that were here-to-fore inaccessible to the community.

Primary Goal Indicator: Identifying new opportunities (AC/GPA selected)

Secondary Goal Indicators: Contributions

Other Indicators:

OI-2: This work involves transformative research.

The technique used in this work transforms the way ecologists measure the importance of material flux between plants and mycorrhizal fungi, as well as presenting alternative interpretations of other existing ecological data sets.

OPP/ARC 2006

Program Officer: William Wiseman

NSF Award Numbers:

9732281

Award Title: The Response of Carbon Cycling in Arctic Ecosystems to Global Change: Regional and Pan-Arctic Assessments

PI Name: John Hobbie

Institution Name: Marine Biological Laboratory
PE Code: 5219

9911278

Award Title: Aquatic Ecosystem Responses to Changes in the Environment of an Arctic Drainage Basin

PI Name: John Hobbie

Institution Name: Marine Biological Laboratory
PE Code: 5280

Submitted on 03/09/2006 by William J. Wiseman

ARC: Approved 03/10/2006 by Kimiko S. Bowens-Knox

OPP: Approved for OPP on 03/10/2006 by Kimiko S. Bowens-Knox